

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平11-197424

(43) 公開日 平成11年(1999) 7月27日

(51) Int.Cl.<sup>®</sup>

B 01 D 39/20  
29/00  
29/11  
29/50  
35/16

識別記号

F I

B 01 D 39/20  
29/00  
35/16  
71/02  
29/10

D  
Z

審査請求 未請求 請求項の数4 O.L (全8頁) 最終頁に続く

(21) 出願番号

特願平10-3633

(22) 出願日

平成10年(1998) 1月12日

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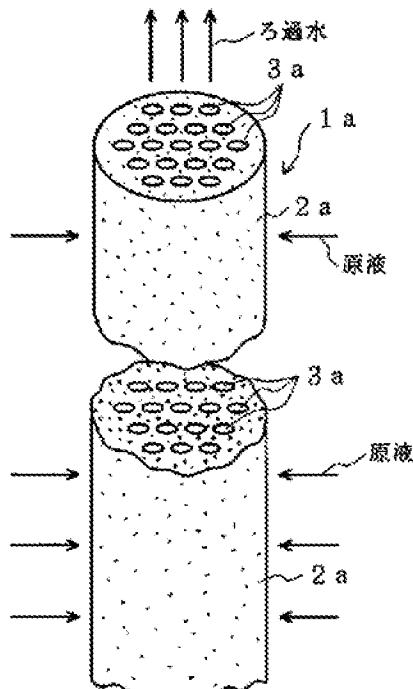
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(54) 【発明の名称】 セラミックろ過材およびそのろ過装置

(57) 【要約】

【課題】 逆洗効果を向上させ、逆洗後の膜面洗浄を不要とし、制御および洗浄水の使用量を低減する。また、セラミックろ過材の取付けまたは取外しを簡単にして付帯設備を簡素化する。

【解決手段】 セラミックろ過材本体2aを円柱状多孔質セラミックス材で形成し、この円柱状多孔質セラミックス材に軸方向に沿って多数の小径貫通孔3aを設ける。ろ過する原液をセラミックろ過材本体2aの外側面から内部へ向けて流し、ろ過したろ液を小径貫通孔3aを通して流出する。原液中のクラッド等の固形分はセラミックろ過材本体2aの外側面に捕捉される。



## 【特許請求の範囲】

【請求項1】 原液を外側面から内部に向けて注入するセラミック製ろ過材本体を円柱状多孔質セラミックス材で形成し、この円柱状多孔質セラミックス材に軸方向に沿ってろ液排出用小径貫通孔を多数個設けてなることを特徴とするセラミック製ろ過材。

【請求項2】 原液を外側面から内部に向けて注入するセラミック製ろ過材本体を円柱状多孔質セラミックス材で形成し、この円柱状多孔質セラミックス材に軸方向に沿ってろ液排出用小径貫通孔を多数個設けてなる多数本のセラミック製ろ過材を、簡法本体胴内に上下部ろ過材取付板を介して着脱自在に組み込み、前記上部ろ過材取付板から上方の前記本体胴側面にオーバーフローノズルを接続するとともに、このオーバーフローノズルの下方にろ過水出口ノズルを接続し、前記下部ろ過材取付板から下方の前記本体胴の側面に原液入口ノズルを設け、前記本体胴の下部に接続した鏡板に逆洗水出口ノズルを設けてなることを特徴とするろ過装置。

【請求項3】 前記上部ろ過材取付板に前記セラミック製ろ過材の上端部を挿入しかつ前記小径貫通孔と連通する貫通孔を設け、前記下部ろ過材取付板には複数の原液入口孔を設けてなることを特徴とする請求項2記載のろ過装置。

【請求項4】 前記原液入口ノズルに原液供給配管を接続し、前記ろ過水出口ノズルにろ過水入口配管を接続し、このろ過水入口配管と前記原液供給配管との間に差圧測定用配管を介して差圧計を設けてなることを特徴とする請求項2記載のろ過装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は例えばクラッド等の圓形分を含む放射性廃液をろ過するためのセラミック製ろ過材およびこのセラミック製ろ過材を組み込んだろ過装置に関する。

## 【0002】

【従来の技術】従来のセラミック製ろ過材は図4に示すように六角柱状多孔質セラミックスによりセラミックろ過材本体2を構成し、このセラミックろ過材本体2に軸方向に沿って多数の小径貫通孔3を設けたものからなっている。セラミックスとしてはアルミナ、シリカ等の耐薬品性材が使用されている。

【0003】このようなろ過材においては、ろ過すべき原液を小径貫通孔3内に上方または下方から流入し、ろ過水をセラミックろ過材本体2の側面から流出するようにして、クラッド等の圓形分ろ過を小径貫通孔3内にとめるようにしている。すなわち、ろ過材本体2に設けた小径貫通孔3から原液を受け入れ、小径貫通孔3からろ過材本体2の外側(側面)へ通水することで、原液中のクラッド等の圓形分を小径貫通孔3に捕捉してろ過するものである。

【0004】つぎに図5(a)、(b)により上記従来のセラミックろ過材1を本体胴内に組み込んで構成したろ過装置について説明する。なお、図5(b)は図5(a)のA-A矢印断面図である。

【0005】図5(a)、(b)において、符号4は上端開口の筒状本体胴で、この本体胴4内に図4に示したセラミックろ過材1が多数本組み込まれている。すなわち、多数本のセラミックろ過材1はそれぞれの両端が上部ろ過材取付板5および下部ろ過材取付板6に嵌め込まれて固定されている。上部ろ過材取付板5および下部ろ過材取付板6間に複数本のタイロッド7が介在されて固定ボルト8により上下ろ過材取付板5、6に固定され、多数本のセラミックろ過材1とともに一体化されている。

【0006】上部ろ過材取付板5および下部ろ過材取付板6と本体胴4との間に複数のOリング9、10が設けられて気密性が保持されている。下部ろ過材取付板6には原液流入孔12が設けられている。本体胴4の下部には鏡板13が接続され、鏡板13に逆洗水出口ノズル14が取付けられている。

【0007】逆洗水出口ノズル14の上方に位置した本体胴4の下部側面には原液入口ノズル15が取着されている。下部シールリング10は下部ろ過材取付板6を支持する台座構造となっており、本体胴4内に密接固定されている。

【0008】上部ろ過材取付板5の下方近傍の本体胴4にろ過水出口ノズル16が取着され、上部ろ過材取付板5の上面に吊り金具17が固定されている。上部ろ過材取付板5および下部ろ過材取付板6とセラミックろ過材1との間にバッキング18が介在されている。

【0009】本体胴4の上部側面に臍面洗浄水入口ノズル19が取着され、この入口ノズル19により上方に位置した本体胴4の上端部側面にオーバーフローノズル20が取着されている。本体胴4の上端開口部には蓋板21が固定ボルトナット22により気密に取着されている。蓋板21の上面にはアイボルト23が取着され、蓋板21の下面と上部ろ過材取付板5の上面との間に取付板押え棒24が設けられている。本体胴4の外側に複数のラグ25が取着されている。

【0010】このように、従来のセラミックろ過材1を組み込んだろ過装置はセラミックろ過材1を上下部のろ過材取付板5および6の間に挟み込み、両取付板5、6をタイロッド7で固定して一体化したものを、吊り金具17を利用して搬運機(図示せず)により本体胴4内に吊り込む構造となっている。

【0011】図6から図8は上記構成に係るろ過装置の通常運転モード、逆洗運転モードおよび臍面洗浄運転モードを示している。図6から図8において、符号26はろ過水受タンクで、このろ過水受タンク26にはろ過水出口ノズル16に接続するろ過水入口配管27が接続している。

ろ過水受タンク26の出口側にはろ過水出口配管28が接続し、ろ過水出口配管28には第1の弁29、流量計30および流量コントロール弁31が順次直列接続されている。

【0012】ろ過水出口配管28の第1の弁29の入口側には圧縮空気供給配管32が第2の弁33を介して接続している。逆洗水出口ノズル14には逆洗水出口配管34が第3の弁35を介して接続している。原液入口ノズル15にはろ過する原液としての廃液を本体胴4内に供給する原液供給配管36が第4の弁37を介して接続している。

【0013】膜面洗浄水入口ノズル19には洗浄水を本体胴4内に供給する洗浄水供給配管38が第5の弁39を介して接続されている。洗浄水供給配管38の第5の弁39の入口側から分岐して原液供給配管36と原液供給配管洗浄水配管40が第6の弁41を介して接続されている。

【0014】番号42は差圧計で、この差圧計42はろ過水入口配管27と原液供給配管36との間に差圧測定用配管43を介して設けられている。圧縮空気供給配管32の第2の弁33の出口側から分岐して圧縮空気ドレン配管44が第7の弁45を介して接続されている。オーバーフローノズル20にはドレン配管46が第8の弁47を介して接続されている。

#### 【0015】

【発明が解決しようとする課題】上記従来の技術において、図6に示すように通常運転時は第1の弁29および第4の弁37を開けて本体胴4内に通水し、流量計30で流量を測定し、流量コントロール弁31により定流量に設定しろ過操作を行う。

【0016】そして、図7に示す系統構成において、差圧計42で所定の差圧まで上昇した場合、または流量計30で所定の積算流量まで上昇した場合は第4の弁37、第1の弁29および流量コントロール弁31を閉じて隔離状態とし、第2の弁33を開けて圧縮空気で加圧した後、第3の弁35を開き、ろ過水受タンク26の水を本体胴4内に通水する、いわゆる逆洗運転を行う。

【0017】その後、図8に示す系統構成において、セラミックろ過材1の小孔に捕獲されたクラッド等の漏形分を外側(側面)へ排出するため、第2の弁33を閉じた後、第5の弁39を開けて洗浄水を本体胴4内に通水する、いわゆる膜面洗浄運転を行い、流量または差圧を復させる。

【0018】しかしながら、従来のセラミック製ろ過材およびそのろ過装置はセラミック製ろ過材1の内部から外側へ向けて通水しているために、ろ過面積が狭く、クラッド等漏形分の捕捉が不十分であり、逆洗効果が低下し、かつ逆洗後の膜面洗浄つまりセラミックろ過材本体2aの表面の洗浄が必要である。したがって、制御および洗浄水の使用量が多く、コストアップとなる課題がある。

【0019】また、ろ過装置は上下部ろ過材取付板に多数本のセラミックろ過材の両端部が固定され、かつ上下

部ろ過材取付板が複数本のタイロッドで連結されてセラミックろ過材とともに一体化されている。そのためろ過材の取付構造が複雑で、重量物となっており、本体胴内への搬入出に際して揚重機を必要とし、付帯設備が多数必要となる課題がある。さらに、上部ろ過材取付板を蓋板から取付板押え棒により押し付けて固定するため、本体胴が長尺化する課題がある。

【0020】本発明は上記課題を解決するためになされたもので、ろ過面積を広くしてクラッド等漏形分の捕捉を広いセラミックろ過材の外側(側面)で行い、逆洗効果が向上し、逆洗後の膜面洗浄を不要とし、制御および洗浄水使用量を削減し、コストダウンでき、揚重機を不要とし、付帯設備を簡素化し、本体胴を短尺化できるセラミック製ろ過材およびそのろ過装置を提供することにある。

#### 【0021】

【課題を解決するための手段】請求項1の発明は、ろ過すべき原液を外側面から内部に向けて注入するセラミック製ろ過材本体が円柱状多孔質セラミックス材で形成され、この円柱状多孔質セラミックス材に軸方向に沿ってろ液排出用小径貫通孔が多数個設けられてなることを特徴とする。

【0022】請求項2の発明は、原液を外側面から内部に向けて注入するセラミック製ろ過材本体を円柱状多孔質セラミックス材で形成し、この円柱状多孔質セラミックス材に軸方向に沿ってろ液排出用小径貫通孔を多数個設けてなる多数本のセラミック製ろ過材を、筒状本体胴内に上下部ろ過材取付板を介して着脱自在に組み込み、前記上部ろ過材取付板から上方の前記本体胴側面にオーバーフローノズルを接続するとともに、このオーバーフローノズルの下方にろ過水出口ノズルを接続し、前記下部ろ過材取付板から下方の前記本体胴の側面に原液入口ノズルを設け、前記本体胴の下部に接続した鏡板に逆洗水出口ノズルを設けてなることを特徴とする。

【0023】請求項3の発明は、前記上部ろ過材取付板に前記セラミック製ろ過材の上端部を挿入しかつ前記小径貫通孔と連通する貫通孔を設け、前記下部ろ過材取付板には複数の原液入口孔を設けてなることを特徴とする。

【0024】請求項4の発明は、前記原液入口ノズルに原液供給配管を接続し、前記ろ過水出口ノズルにろ過水入口配管を接続し、このろ過水入口配管と前記原液供給配管との間に差圧測定用配管を介して差圧計を設けてなることを特徴とする。

#### 【0025】

【発明の実施の形態】図1から図3により本発明に係るセラミック製ろ過材およびそのろ過装置の実施の形態を説明する。なお、図1から図3中、図4から図8と同一部分ないしは同様な機能を有する部分については同一符号を付している。

【0026】図1において、セラミックろ過材1aは例えばアルミナ、シリカ等のセラミックろ過材本体2aを円柱状多孔質セラミックス材で形成し、この円柱状多孔質セラミックス材に軸方向に沿って多数の小径貫通孔3aを設けてなるものである。小径貫通孔3aの直径は例えば4mm前後とする。

【0027】このセラミックス製ろ過材においてはセラミックろ過材本体2aの外側（側面）から内側に向けて原液を通水すると、ろ過水は本体2a自身の小さい多くの孔から小径貫通孔3aを通ってろ過水が流出する。クラッド等圓形分はセラミックろ過材本体2aの外側面に捕捉される。

【0028】外側面に捕捉されたクラッド等圓形分は小径貫通孔3a内に逆洗水を圧入して外側面に流出することにより容易に剥離される。したがって、本実施の形態に係るセラミックろ過材によれば、逆洗効果が向上し、逆洗後の膜面洗浄が不要となり、制御および洗浄水の使用量が削減できる。

【0029】つぎに図2(a)、(b)により図1に示したセラミックろ過材1aを本体胴4a内に組み込んでろ過装置を構成した実施形態を説明する。なお、図2(b)は図2(a)のA-A矢視断面図である。

【0030】本体胴4a内には図1で説明した構造のセラミックろ過材1aが上下部ろ過材取付板48、49により固定されている。なお、図2(a)では簡明の都合上セラミックろ過材1aは2本のみ拡大して示しているが、実際には図2(b)のA-A矢視断面図のように多数本が上下部ろ過材取付板48、49に取付けられている。

【0031】上部ろ過材取付板48Cはセラミックろ過材1aの上端部を挿入し、かつ小径貫通孔3aと連通するための貫通孔（符号図示せず）が設けられ、この貫通孔とセラミックろ過材1aの上端部外周面との間に上部パッキング50が介在されて気密性を保っている。上部パッキング50は固定板51により上方から押し付けられ、固定板51はボルト52により上部ろ過材取付板48Cに固定される。

【0032】一方、下部ろ過材取付板49は多数の廃液流入孔53とセラミックろ過材1aの下端部を固定する四部（符号図示せず）を有し、四部内に下部パッキング54を嵌め込みセラミックろ過材1aの下端部との気密性を保持している。

【0033】本体胴4aは上部側面にオーバーフローノズル20およびろ過水出口ノズル15が接続し、下部に原液入口ノズル15と下端部に逆洗水出口ノズル14が接続している。オーバーフローノズル20の内側を覆うようにしてバッフルプレート55が本体胴4aの上部内面に取付けられている。

【0034】つぎに図3により図2に示したろ過装置の通常時のろ過運転および逆洗運転方法を説明する。図3において、通常のろ過運転を行う場合には第2の弁33、

第6から第8の弁41、45、47を閉じ、第1の弁29と流量コントロール弁31を開き、ろ過する廃液（原液）を第4の弁37を開いて、原液供給配管36を通して原液入口ノズル15から本体胴4a内に流入する。

【0035】本体胴4a内に流入した原液は廃液流入孔53を通り、セラミックろ過材1aの外側面から内部に流れ込んでろ過され、そのろ過水は小径貫通孔3a内を通してろ過水出口ノズル16からろ過水入口配管27を流出してろ過水受タンク26内に送り込まれる。

【0036】ろ過水受タンク26内に貯留されたろ過水はろ過水出口配管28から第1の弁29、流量計30および流量コントロール弁31を経て排出される。このろ過運転時にセラミックろ過材1aに目詰りを生じた場合にはろ過運転を中止して逆洗時の運転に切り替える。

【0037】逆洗時の運転は図3に示す系統構成を太線および黒塗り部分のように切り替え、差圧計42で所定の差圧まで上昇した場合、または流量計で所定の積算流量まで上昇した場合は第4の弁37、第1の弁29および流量コントロール弁31を閉じて隔離状態とする。

【0038】そして、第2の弁33を開けて本体胴4a内を圧縮空気によりろ過水受タンク26、ろ過水入口配管27、ろ過水出口ノズル16を通して加圧した後、第3の弁35を開けてろ過水受タンク26内のろ過水を本体胴4a内に通水する、いわゆる逆洗運転を行い、流量または差圧を回復させる。

【0039】しかし、本実施の形態によれば、セラミックろ過材1aを円柱状に形成し、クラッド等圓形分を含む例えば放射性廃液をろ過する際、セラミックろ過材本体2aの外側つまり側面から内側に向けて通水することにより、クラッド等圓形分の捕捉を広い外面で行うことができる。

【0040】また、原液入口ノズル15C接続した原液供給配管36とろ過水出口ノズル16C接続したろ過水入口配管27との間に差圧測定用配管43を介して差圧計42を設けることにより、セラミックろ過材1aを本体胴4a内に組み込んだ後、セラミックろ過材1aの耐圧、漏洩確認を、圧縮空気のラインを通して本体胴4a内を加圧することにより容易にできる。

【0041】さらに、セラミックろ過材1aの上部を二回水をろ過水とすることができる。これをろ過水受タンク26C貯留して、逆洗時の洗浄水の使用量を低減することができるとともに、逆洗後のセラミックろ過材1aの外側、つまり膜面を洗浄する必要がない。

【0042】また、セラミックろ過材1aを本体胴4a内の上下部ろ過材48、49C取付け、固定する作業を本体胴4a内で行うことができるため、揚重機が不要となり、付帯設備が簡素化され、コストダウンすることができる。

【0043】

【発明の効果】本発明に係るセラミックろ過材によれ

は、セラミックろ過材本体の外面（側面）から内側に向けてろ過する原液を通水するため、ろ過面積が広くされることにより、クラッド等の源形分を広い外面（側面）から捕捉することができる。また、小径貫通孔から逆洗水を流入してセラミックろ過材本体の外面（側面）を逆洗するため、逆洗効果が向上するとともに、逆洗後の膜面洗浄が不要となり、制御および洗浄水使用量が低減できる。

【0044】本発明に係る通装置によれば、本体胴内へのセラミック製通材の取付けまたは取外しが容易となる。また、従来例のタイロッド、シールリング、吊り金具および取付板押え棒が不要で軽量化するので、掲重機が不要となるとともに、付帯設備が簡素化し、本体胴が短尺化して、コストダウンが可能となる。さらに、セラミック製通材を本体胴内に取付後のセラミック製通材の耐圧、漏洩確認を圧縮空気系を利用して行うことができる。

### 【図面の簡単な説明】

【図1】本発明に係るセラミック製の過材の実施の形態を一部切次して示す斜視図。

【図2】(a)は本発明に係る過装置の実施の形態を示す縦断面図、(b)は(a)におけるA-A矢根断面図。

【図3】図2における各過濾機の逆洗運転時のモードを示す系統図。

【図4】従来のセラミック遮材を一部切欠して示す斜複屈。

【図5】(a) は図4に於けるセラミックる過材を組み  
込んだる過装置を示す縦断面図。(b) は (a) における

來名之為矢視斷面圖。

【図6】図5における各過渡装置の通常運転時のモードを示す系統図

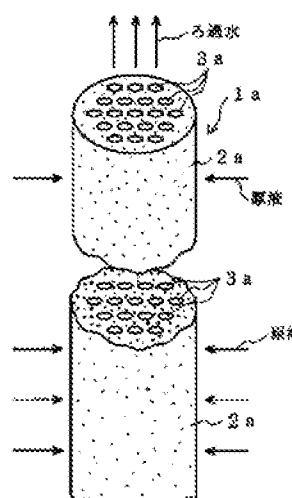
【図7】図5における過装置の逆洗運動時のモードを示す系統図

【図8】図4におけるろ過装置の膜面洗浄運転時のモードを示す系統図。

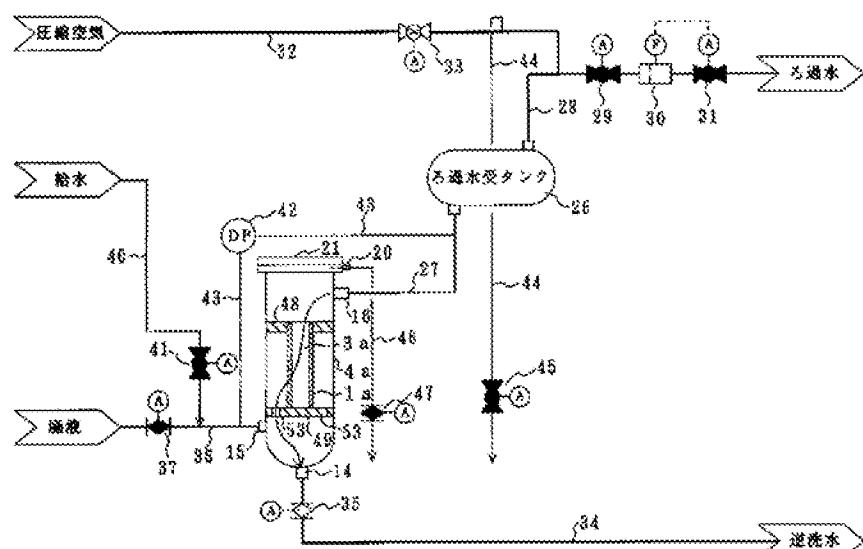
### 〔境界の透明〕

1. 1 a…セラミックろ過材、2. 2 a…セラミックろ過材本体、3. 3 a…小径貫通孔、4. 4 a…本体洞、5…上部ろ過材取付板、6…下部ろ過材取付板、7…タイロッド、8…锁定ボルト、9…上部シールリング、10…下部シールリング、11…Oリング、12…原液流入孔、13…鏡板、14…逆洗水出口ノズル、15…原液入口ノズル、16…ろ過水出口ノズル、17…吊り金具、18…パッキング、19…膜面洗浄水入口ノズル、20…オーバーフローノズル、21…蓋板、22…锁定ボルトナット、23…アイボルト、24…取付板押え棒、25…ラグ、26…ろ過水受タンク、27…ろ過水入口配管、28…ろ過水出口配管、29…第1の弁、30…流量計、31…塗装コントロール弁、32…圧縮空気供給配管、33…第2の弁、34…逆洗水出口配管、35…第3の弁、36…原液供給配管、37…第4の弁、38…洗浄水供給配管、39…第5の弁、40…原液供給配管用洗浄水配管、41…第6の弁、42…差圧計、43…差圧測定用配管、44…圧縮空気ドレン配管、45…第7の弁、46…ドレン配管、47…第8の弁、48…上部ろ過材取付板、49…下部ろ過材取付板、50…上部パッキング、51…锁定板、52…ボルト、53…廃液流入孔、54…下部パッキング、55…パッフルプレート。

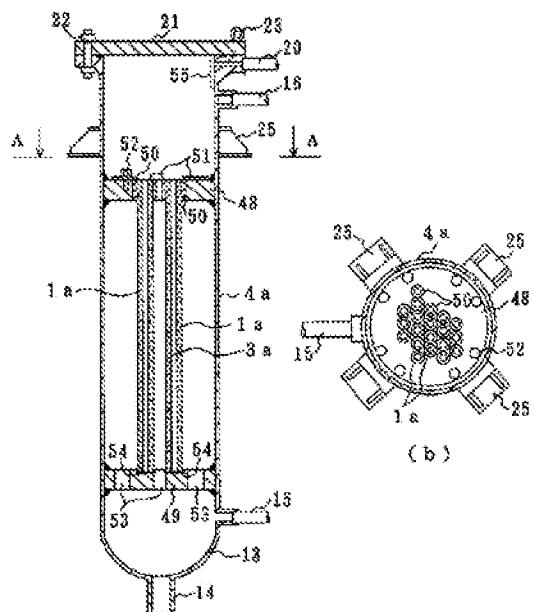
三



131

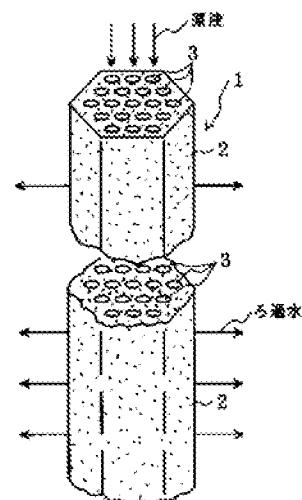


【図2】

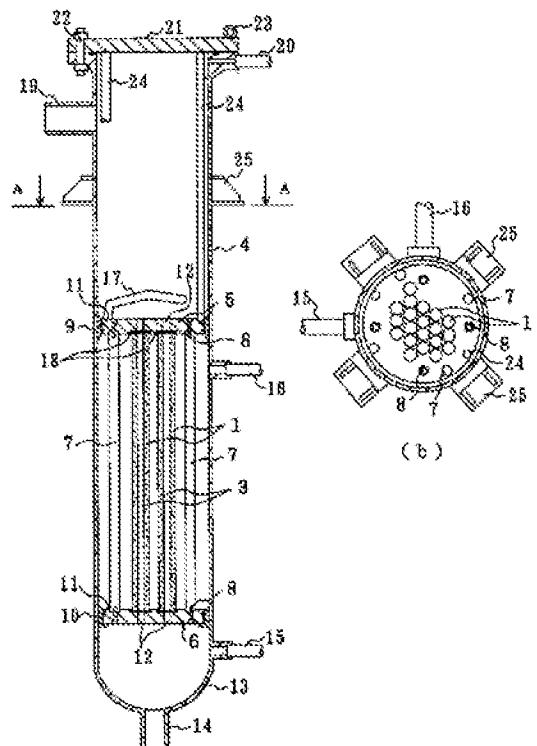


(a)

【図4】

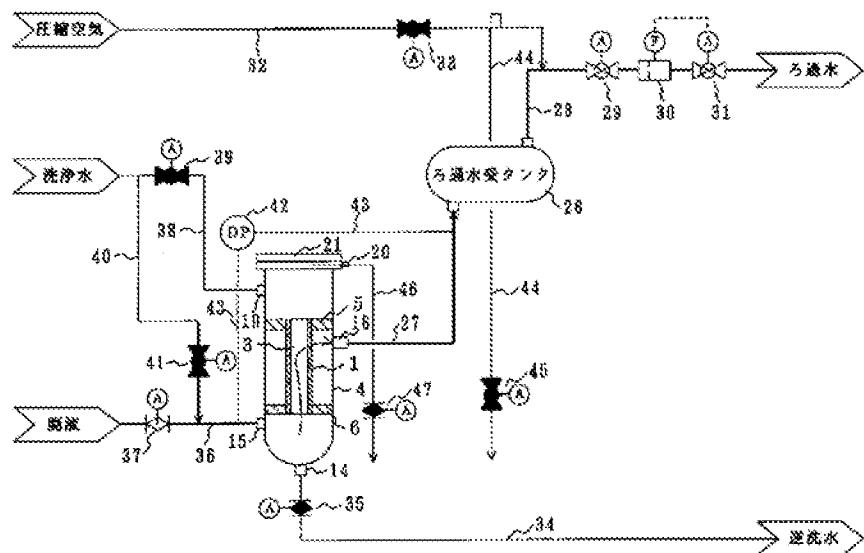


【図5】

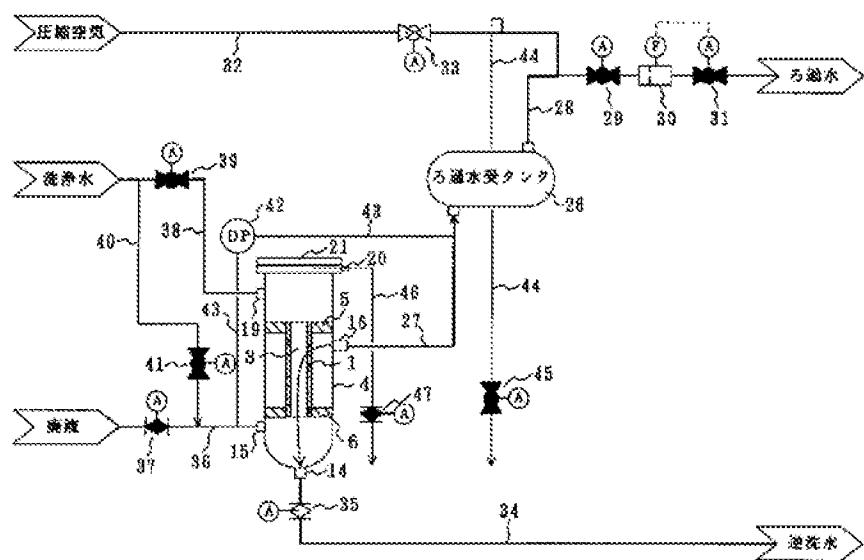


(a)

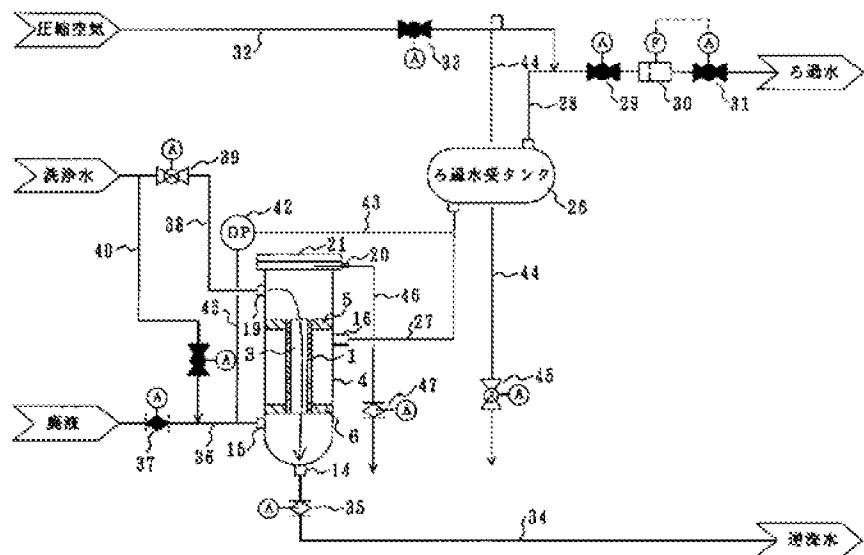
【図6】



【図7】



【図8】



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : **11-197424**(43)Date of publication of application : **27.07.1999**


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(51)Int.Cl. B01D 39/20  
 B01D 29/00  
 B01D 29/11  
 B01D 29/50  
 B01D 35/16  
 B01D 71/02

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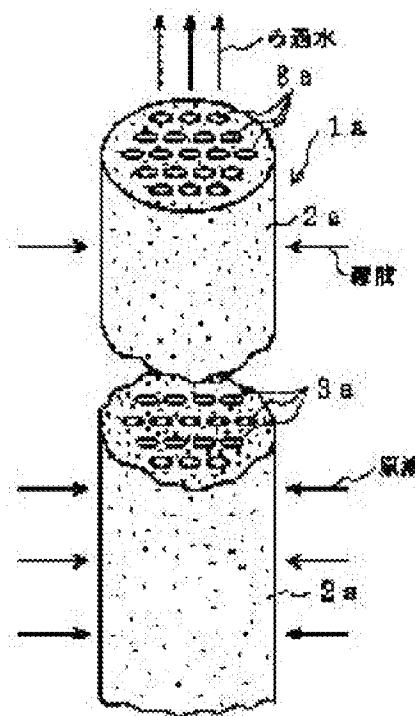
(21)Application number : **10-003683** (71) Applicant : **TOSHIBA CORP**  
 (22)Date of filing : **12.01.1998** (72) Inventor : **TOSHIBA ENG CO LTD**  
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**UEHARA YUJI**

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**(54) CERAMIC FILTER MEDIUM AND FILTRATION DEVICE USING THIS MEDIUM****(57)Abstract:**

**PROBLEM TO BE SOLVED:** To improve the backward wash effect and dispense with the washing of a membrane face after the backward washing and further, reduce the consumption of water for control and also a cleaning water, with the simplification of an operation to mount and remove a ceramic filter medium and an incidental installation.

**SOLUTION:** A ceramic filter medium body 2a is formed of a columnar porous ceramic material, in which numerous small dia. through holes 3a are formed in the axial direction of the material. A row solution to be filtered is flown into the interior of the ceramic filter medium body 2a from its outer lateral face and the filtrate is flown out of the small dia. through holes 3a. The solid content such as a cladding contained in the row solution is captured by the outer lateral face of the ceramic filter medium body 2a.



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## CLAIMS

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### [Claim(s)]

[Claim 1] A filter medium made from ceramics which forms a main part made from ceramics of a filter medium which turns an undiluted solution to an inside and pours it in from lateral surface by cylindrical porous-ceramics material, provides many byway breakthroughs for filtrate discharge in this cylindrical porous-ceramics material along shaft orientations, and is characterized by things.

[Claim 2] A main part made from ceramics of a filter medium which turns an undiluted solution to an inside and pours it in from lateral surface is formed by cylindrical porous-ceramics material, A filter medium made from ceramics of an a large number book which provides many byway breakthroughs for filtrate discharge in this cylindrical porous-ceramics material along shaft orientations, While incorporating via a vertical section filter-medium tie-down plate in a cylindrical body trunk, enabling free attachment and detachment and connecting an exaggerated flow nozzle to said upper body shell side from said top filter-medium tie-down plate, A filter which connects a filtered water outlet nozzle under this exaggerated flow nozzle, provides a stock solution inlet nozzle in the side of said downward body shell from said lower filter-medium tie-down plate, provides a backwashing water outlet nozzle in a panel linked to the lower part of said body shell, and is characterized by things.

[Claim 3] The filter according to claim 2 which inserts an upper bed part of said filter medium made from ceramics in said top filter-medium tie-down plate, and provides said byway breakthrough and a breakthrough open for free passage, provides two or more stock solution inlet holes in said lower filter-medium tie-down plate, and is characterized by things.

[Claim 4] The filter according to claim 2 which connects an undiluted solution charging line to said stock solution inlet nozzle, connects a filtered water entrance line to said filtered water outlet nozzle, forms a differential pressure gauge via piping for differential pressure measurement between this filtered water entrance line and said undiluted solution charging line, and is characterized by things.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Field of the Invention] This invention relates to the filter incorporating the filter medium made from ceramics and this filter medium made from ceramics for filtering the radioactive effluent containing solid content, such as a clad.

#### [0002]

[Description of the Prior Art] The conventional filter medium 1 made from ceramics constitutes the main part 2 of a ceramic filter medium with hexagonal prism-like porous ceramics, as shown in drawing 4, and it consists of what formed many byway breakthroughs 3 in this main part 2 of a ceramic filter medium along shaft orientations. Chemical-resistant material, such as alumina and silica, is used as ceramics.

[0003] Flow the undiluted solution which should be filtered from the upper part or a lower part in the byway breakthrough 3, and he makes filtered water flow out of the side of the main part 2 of a ceramic filter medium, and is trying to stop solid content \*\*\*\*, such as a clad, in the byway breakthrough 3 in such a filter medium 1. That is, an undiluted solution is received from the byway breakthrough 3 provided in the main part 2 of a filter medium, and solid content, such as a clad in an undiluted solution, is caught and filtered to the byway breakthrough 3 by letting water flow from the byway breakthrough 3 to the outside (side) of the main part 2 of a filter medium.

[0004] The filter which incorporated the above-mentioned conventional ceramic filter medium 1 in the body shell, and constituted it by drawing 5 (a) and (b) next is explained.

Drawing 5 (b) is an A-A arrowed cross-section figure of drawing 5 (a).

[0005] In drawing 5 (a) and (b), the numerals 4 are the cylindrical body trunks of an upper bed opening, and several ceramic many filter media 1 shown in drawing 4 are incorporated in this body shell 4. That is, each both ends are inserted in the top filter-medium tie-down plate 5 and the lower filter-medium tie-down plate 6, and many ceramic filter media 1 of the book are being fixed. Between the top filter-medium tie-down plate 5 and the lower filter-medium tie-down plate 6, two or more tie rods 7 intervene, and it is fixed to the up-and-down filter-medium tie-down plates 5 and 6 with the securing bolt 8, and is unified by a large number with the ceramic filter medium 1 of the book.

[0006] Between the top filter-medium tie-down plate 5 and the lower filter-medium tie-down plate 6, and the body shell 4, the vertical section seal rings 9 and 10 are formed via two or more O rings 11, and airtightness is held. The undiluted solution incurrent pore 12 is formed in the lower filter-medium tie-down plate 6. The panel 13 is connected to the lower part of the body shell 4, and the backwashing water outlet nozzle 14 is attached to the

panel 13.

[0007]The stock solution inlet nozzle 15 is attached in the lower side of the body shell 4 located above the backwashing water outlet nozzle 14. The lower seal ring 10 has plinth structure which supports the lower filter-medium tie-down plate 6, and welding immobilization is carried out into the body shell 4.

[0008]The filtered water outlet nozzle 16 is attached in the body shell 4 near the lower part of the top filter-medium tie-down plate 5, it hangs on the upper surface of the top filter-medium tie-down plate 5, and the metal fittings 17 are being fixed. The packing 18 intervenes between the top filter-medium tie-down plate 5 and the lower filter-medium tie-down plate 6, and the ceramic filter medium 1.

[0009]The film surface washing water inlet nozzle 19 is attached in the upper side of the body shell 4, and the exaggerated flow nozzle 20 is attached in the upper bed part side of the body shell 4 in which it was located up by this entrance nozzle 19. The cover plate 21 is airtightly attached in the upper bed opening of the body shell 4 with the fixed bolt nut 22. The eyebolt 23 is attached in the upper surface of the cover plate 21, and the tie-down plate pressure bar 24 is formed between the undersurface of the cover plate 21, and the upper surface of the top filter-medium tie-down plate 5. Two or more lugs 25 are attached in the outside surface of the body shell 4.

[0010]Thus, the filter incorporating the conventional ceramic filter medium 1 puts the ceramic filter medium 1 among the filter-medium tie-down plates 5 and 6 of a vertical section, It has structure which hangs what fixed both the tie-down plates 5 and 6 with the tie rod 7, and was unified, and hangs it in the body shell 4 by a lifting equipment (not shown) using the metal fittings 17.

[0011]Drawing 8 shows the usual mode of operation, the back wash mode of operation, and film surface washing operation mode of the filter concerning the above-mentioned composition from drawing 6. In drawing 8 from drawing 6, the numerals 26 are filtered water carrier tanks, and the filtered water entrance line 27 linked to the filtered water outlet nozzle 16 has connected with this filtered water carrier tank 26. The filtered water outlet piping 28 connects with the outlet side of the filtered water carrier tank 26, and the series connection of the 1st valve 29, flow instrument 30, and flow control valve 31 is carried out to the filtered water outlet piping 28 one by one.

[0012]The compressed-air-supply piping 32 has connected with the entrance side of the 1st valve 29 of the filtered water outlet piping 28 via the 2nd valve 33. The backwashing water outlet piping 34 has connected with the backwashing water outlet nozzle 14 via the 3rd valve 35. The undiluted solution charging line 36 which supplies the waste fluid as an undiluted solution to filter in the body shell 4 has connected with the stock solution inlet nozzle 15 via the 4th valve 37.

[0013]The wash water charging line 38 which supplies wash water in the body shell 4 is connected to the film surface washing water inlet nozzle 19 via the 5th valve 39. It branches from the entrance side of the 5th valve 39 of the wash water charging line 38, and the wash water piping 40 for undiluted solution charging lines is connected to the undiluted solution charging line 36 via the 6th valve 41.

[0014]The numerals 42 are differential pressure gauges and this differential pressure gauge 42 is formed via the piping 43 for differential pressure measurement between the filtered water entrance line 27 and the undiluted solution charging line 36. It branches from the outlet side of the 2nd valve 33 of the compressed-air-supply piping 32, and compressed air

drain piping 44 is connected via the 7th valve 45. Drain piping 46 is connected to the exaggerated flow nozzle 20 via the 8th valve 47.

[0015]

[Problem(s) to be Solved by the Invention] In the above-mentioned conventional art, as shown in drawing 6, the 1st valve 29 and 4th valve 37 are opened at the time of operation, it lets water flow in the body shell 4, measures a flow with the flow instrument 30, sets it as the amount of steady flow by the flow control valve 31, and usually performs filtration operation.

[0016] And when it goes up to predetermined differential pressure with the differential pressure gauge 42 in the system configuration shown in drawing 7, Or when it goes up to a predetermined integrating flow rate with the flow instrument 30, close the 4th valve 37, 1st valve 29, and flow control valve 31, and it changes into an isolation state, After opening the 2nd valve 33 and pressurizing by compressed air, what is called back wash operation that opens the 3rd valve 35 and lets the water of the filtered water carrier tank 26 flow in the body shell 4 is performed.

[0017] Then, in order to discharge solid content, such as a clad caught by the stoma of the ceramic filter medium 1, to an outside surface (side) in the system configuration shown in drawing 8, After closing the 2nd valve 33, what is called film surface washing operation that opens the 5th valve 39 and lets wash water flow in the body shell 4 is performed, and a flow or differential pressure is recovered.

[0018] However, since the conventional filter medium made from ceramics and its filter are letting water flow towards the outside from the inside of the filter medium 1 made from ceramics, A filtration area is narrow, prehension of solid content, such as a clad, is insufficient, the back wash effect falls and the surface of the main part 2a of a ceramic filter medium needs film surface washing after a back wash, i.e., to be washed. Therefore, there is much amount of control and the wash water used, and the technical problem used as a cost hike occurs.

[0019] Many both ends of the ceramic filter medium of a book are fixed to a vertical section filter-medium tie-down plate, and a vertical section filter-medium tie-down plate is connected with two or more tie rods, and the filter is unified with the ceramic filter medium. Therefore, the mounting structure of a filter medium is complicated, serves as a heavy lift, and needs a lifting equipment on the occasion of the carrying-in appearance into a body shell, and the technical problem for which much incidental facilities are needed occurs.

Since a top filter-medium tie-down plate is pushed by a tie-down plate pressure bar from a cover plate and it fixes, the technical problem which a body shell long-picture-izes occurs.

[0020] This invention was made in order to solve an aforementioned problem, it makes a filtration area large, and catches solid content, such as a clad, on the outside (side) of a large ceramic filter medium, The back wash effect improves and film surface washing after a back wash is made unnecessary, and control and the amount of the wash water used are reduced, the cost can be cut down, a lifting equipment is made unnecessary, incidental facilities are simplified, and it is in providing the filter medium made from ceramics which can carry out [ short length ]-izing of the body shell, and its filter.

[0021]

[Means for Solving the Problem] A main part made from ceramics of a filter medium which an invention of claim 1 turns to an inside an undiluted solution which should be filtered from lateral surface, and is poured in is formed by cylindrical porous-ceramics material, and

it comes to provide many byway breakthroughs for filtrate discharge in this cylindrical porous-ceramics material along shaft orientations.

[0022]An invention of claim 2 forms a main part made from ceramics of a filter medium which turns an undiluted solution to an inside and pours it in from lateral surface by cylindrical porous-ceramics material, A filter medium made from ceramics of an a large number book which provides many byway breakthroughs for filtrate discharge in this cylindrical porous-ceramics material along shaft orientations, While incorporating via a vertical section filter-medium tie-down plate in a cylindrical body trunk, enabling free attachment and detachment and connecting an exaggerated flow nozzle to said upper body shell side from said top filter-medium tie-down plate, A filtered water outlet nozzle is connected under this exaggerated flow nozzle, a stock solution inlet nozzle is provided in the side of said downward body shell from said lower filter-medium tie-down plate, and a backwashing water outlet nozzle is provided in a panel linked to the lower part of said body shell.

[0023]An invention of claim 3 inserts an upper bed part of said filter medium made from ceramics in said top filter-medium tie-down plate, and provides said byway breakthrough and a breakthrough open for free passage, and provides two or more stock solution inlet holes in said lower filter-medium tie-down plate.

[0024]An invention of claim 4 connects an undiluted solution charging line to said stock solution inlet nozzle, connects a filtered water entrance line to said filtered water outlet nozzle, and forms a differential pressure gauge via piping for differential pressure measurement between this filtered water entrance line and said undiluted solution charging line.

[0025]

[Embodiment of the Invention]The embodiment of the filter medium made from ceramics applied to this invention by drawing 3 from drawing 1 and its filter is described. About the portion which has drawing 6, identical parts, or the same function from drawing 4, identical codes are attached among drawing 3 from drawing 1.

[0026]In drawing 1, the ceramic filter medium 1a forms the main parts 2a of a ceramic filter medium, such as alumina and silica, by cylindrical porous-ceramics material, and forms many byway breakthroughs 3a in this cylindrical porous-ceramics material along shaft orientations. The diameter of the byway breakthrough 3a shall be around 4 mm.

[0027]If it lets an undiluted solution flow towards the inside in this filter medium made from ceramics from the outside (side) of the main part 2a of a ceramic filter medium, as for filtered water, filtered water will flow out of the hole of main part 2a itself [ small / many of ] through the byway breakthrough 3a. Solid content, such as a clad, is caught by the lateral surface of the main part 2a of a ceramic filter medium.

[0028]Solid content, such as a clad caught by the lateral surface, exfoliates easily by pressing backwashing water fit in the byway breakthrough 3a, and flowing into the lateral surface. Therefore, according to the filter medium made from ceramics concerning this embodiment, the back wash effect improves, film surface washing after a back wash becomes unnecessary, and the amount of control and the wash water used can be reduced.

[0029]The embodiment which incorporated the ceramic filter medium 1a shown in drawing 1 in the body shell 4a, and constituted the filter by drawing 2 (a) and (b) next is described. Drawing 2 (b) is an A-A arrowed cross-section figure of drawing 2 (a).

[0030]In the body shell 4a, the ceramic filter medium 1a of structure explained by drawing 1 is being fixed by the vertical section filter-medium tie-down plates 48 and 49. Although the two ceramic filter media 1a are accepted, are expanded and drawing 2 (a) shows on account of explanation, as shown in the A-A arrowed cross-section figure of drawing 2 (b), many books are actually attached to the vertical section filter-medium tie-down plates 48 and 49.

[0031]The breakthrough (a numerals graphic display is not carried out) for inserting the upper bed part of the ceramic filter medium 1a in the top filter-medium tie-down plate 48, and being open for free passage with the byway breakthrough 3a is provided, the top packing 50 intervenes between this breakthrough and the upper bed outside peripheral surface of the ceramic filter medium 1a, and airtightness is maintained. The top packing 50 is pushed by the stationary plate 51 from the upper part, and the stationary plate 51 is fixed to the top filter-medium tie-down plate 48 with the bolt 52.

[0032]On the other hand, the lower filter-medium tie-down plate 49 has a crevice (a numerals graphic display is not carried out) which fixes the lower end part of many waste stream ON holes 53 and the ceramic filter medium 1a, inserts in the lower packing 54 in a crevice, and holds airtightness with the lower end part of the ceramic filter medium 1a.

[0033]The exaggerated flow nozzle 20 and the filtered water outlet nozzle 16 connected with the upper side, and the backwashing water outlet nozzle 14 has connected the body shell 4a to the lower part at the stock solution inlet nozzle 15 and the lower end part. As the inside of the exaggerated flow nozzle 20 is covered, the baffle plate 55 is attached to the upper inner surface of the body shell 4a.

[0034]Filtration operation at the time of usual [ of the filter shown in drawing 2 by drawing 3 below ] and a back wash operating method are explained. In drawing 3, in performing the usual filtration operation, it closes the 2nd valve 33 and the 6th to 8th valve 41, 45, and 47, The 1st valve 29 and flow control valve 31 are opened, the 4th valve 37 is opened and the waste fluid (undiluted solution) to filter is flowed in the body shell 4a from the stock solution inlet nozzle 15 through the undiluted solution charging line 36.

[0035]the undiluted solution which flowed in the body shell 4a should pass along the waste stream ON hole 53, and should be flowing into an inside from the lateral surface of the ceramic filter medium 1a -- pass and the filtered water should be letting the inside of the byway breakthrough 3a pass -- flow the filtered water entrance line 27 out of the filtered-water outlet nozzle 16 -- it is sent in in the filtered-water carrier tank 26.

[0036]The filtered water stored in the filtered water carrier tank 26 is discharged through the 1st valve 29, flow instrument 30, and flow control valve 31 from the filtered water outlet piping 28. When clogging is produced in the ceramic filter medium 1a at the time of this filtration operation, filtration operation is stopped and it changes to operation at the time of a back wash.

[0037]When the system configuration shown in drawing 3 is changed like a thick line and a black painting portion and it goes up to predetermined differential pressure with the differential pressure gauge 42, or when it goes up to a predetermined integrating flow rate with a flow instrument, operation at the time of a back wash closes the 4th valve 37, 1st valve 29, and flow control valve 31, and is changed into an isolation state.

[0038]And after opening the 2nd valve 33 and pressurizing the inside of the body shell 4a through the filtered water carrier tank 26, the filtered water entrance line 27, and the

filtered water outlet nozzle 16 by compressed air, What is called back wash operation that opens the 3rd valve 35 and lets flow the filtered water in the filtered water carrier tank 26 in the body shell 4a is performed, and a flow or differential pressure is recovered.

[0039]By carrying out a deer, and letting water flow towards the inside, when filtering a radioactive effluent, for example, it forms the filter medium 1a made from ceramics cylindrical and solid content, such as a clad, is included according to this embodiment, the outside, i.e., the side, of the main part 2a of a ceramic filter medium, Solid content, such as a clad, can be caught by a large appearance.

[0040]By forming the differential pressure gauge 42 via the piping 43 for differential pressure measurement between the filtered water entrance lines 27 linked to the undiluted solution charging line 36 linked to the stock solution inlet nozzle 15, and the filtered water outlet nozzle 16, After incorporating the ceramic filter medium 1a in the body shell 4a, pressure-proofing of the ceramic filter medium 1a and a disclosure check can be made easy by pressurizing the inside of the body shell 4a through the line of compressed air.

[0041]While being able to use downstream water as filtered water for the upper part of the ceramic filter medium 1a, being able to store this in the filtered water carrier tank 26 and being able to reduce the amount of the wash water used at the time of a back wash, it is not necessary to wash the outside of the ceramic filter medium 1a after a back wash, i.e., a film surface.

[0042]Since the ceramic filter medium 1a can be attached to the vertical section filter media 48 and 49 in the body shell 4a and the work to fix can be done within the body shell 4a, a lifting equipment becomes unnecessary, incidental facilities are simplified, and the cost can be cut down.

[0043]

[Effect of the Invention]Since it lets flow the undiluted solution filtered towards the inside from the outside surface (side) of the main part of a ceramic filter medium according to the filter medium made from ceramics concerning this invention, solid content, such as a clad, can be caught from a large outside surface (side) by the ability to take a large filtration area. In order to flow backwashing water from a byway breakthrough and to carry out the back wash of the outside surface (side) of the main part of a ceramic filter medium, while the back wash effect improves, film surface washing after a back wash becomes unnecessary, and control and the amount of the wash water used can be reduced.

[0044]According to the filter concerning this invention, attachment or removal of the filter medium made from ceramics into a body shell becomes easy. the tie rod of a conventional example and a seal ring -- by hanging, metal fittings and a tie-down plate pressure bar are unnecessary, since a weight saving is carried out, while a lifting equipment becomes unnecessary, incidental facilities simplify, a body shell short-length-izes, and a cost cut becomes possible. Pressure-proofing of the filter medium made from ceramics after attaching the filter medium made from ceramics in a body shell and a disclosure check can be performed using a compressed air system.

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[Translation done.]

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The perspective view cutting and showing a part of embodiment of the filter medium made from ceramics concerning this invention.

[Drawing 2] As for (a), (b) is drawing of longitudinal section showing the embodiment of the filter concerning this invention, and an A-A arrowed cross-section figure in (a).

[Drawing 3] The distribution diagram showing the mode at the time of back wash operation of the filter in drawing 2.

[Drawing 4] The perspective view cutting and showing some conventional ceramic filter media.

[Drawing 5] As for (a), (b) is drawing of longitudinal section showing the filter incorporating the ceramic filter medium in drawing 4, and an A-A arrowed cross-section figure in (a).

[Drawing 6] The distribution diagram showing the mode at the time of usual operation of the filter in drawing 5.

[Drawing 7] The distribution diagram showing the mode at the time of back wash operation of the filter in drawing 5.

[Drawing 8] The distribution diagram showing the mode at the time of the film surface washing operation of the filter in drawing 5.

[Description of Notations]

1 1a -- A ceramic filter medium, 2, 2a -- The main part of a ceramic filter medium, 3, 3a -- Byway breakthrough, 4 4a -- A body shell, 5 -- A top filter-medium tie-down plate, 6 -- Lower filter-medium tie-down plate, 7 [ -- Lower seal ring, ] -- A tie rod, 8 -- A securing bolt, 9 -- A top seal ring, 10 11 [ -- Backwashing water outlet nozzle, ] -- An O ring, 12 -- An undiluted solution incurrent pore, 13 -- A panel, 14 15 -- A stock solution inlet nozzle, 16 -- A filtered water outlet nozzle, 17 -- Hang and Metal fittings, 18 -- Packing, 19 -- A film surface washing water inlet nozzle, 20 -- Exaggerated flow nozzle, 21 [ -- Tie-down plate pressure bar, ] -- A cover plate, 22 -- A fixed bolt nut, 23 -- An eyebolt, 24 25 [ -- Filtered water outlet piping, ] -- A lug, 26 -- A filtered water carrier tank, 27 -- A filtered water entrance line, 28 29 [ -- Compressed-air-supply piping, ] -- The 1st valve, 30 -- A flow instrument, 31 -- A flow control valve, 32 33 [ -- Undiluted solution charging line, ] -- The 2nd valve, 34 -- Backwashing water outlet piping, 35 -- The 3rd valve, 36 37 [ -- Wash water piping for undiluted solution charging lines, ] -- The 4th valve, 38 -- A wash water charging line, 39 -- The 5th valve, 40 41 [ -- Compressed air drain piping, 45 / -- The 7th valve, 46 / -- Drain piping, 47 / -- The 8th valve, 48 / -- A top filter-medium tie-down plate, 49 / -- Lower filter-medium tie-down plate, ] -- The 6th valve, 42 -- A differential pressure

gauge, 43 -- Piping for differential pressure measurement, 44 50 [ -- A waste stream ON hole 54 / -- Lower packing, 55 / -- Baffle plate. ] -- Top packing, 51 -- A stationary plate, 52 -- A bolt, 53

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[Translation done.]

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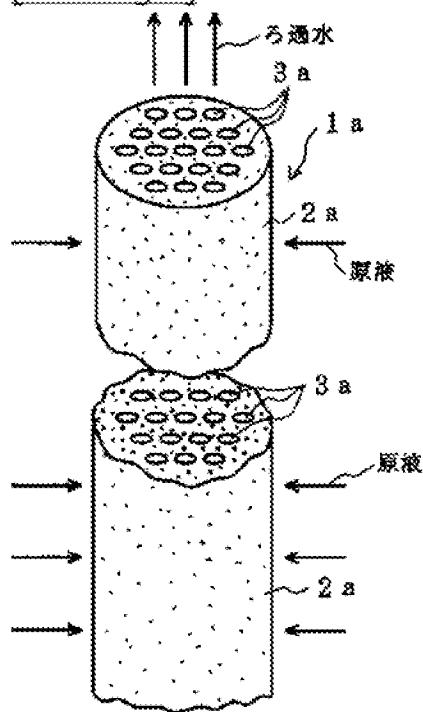
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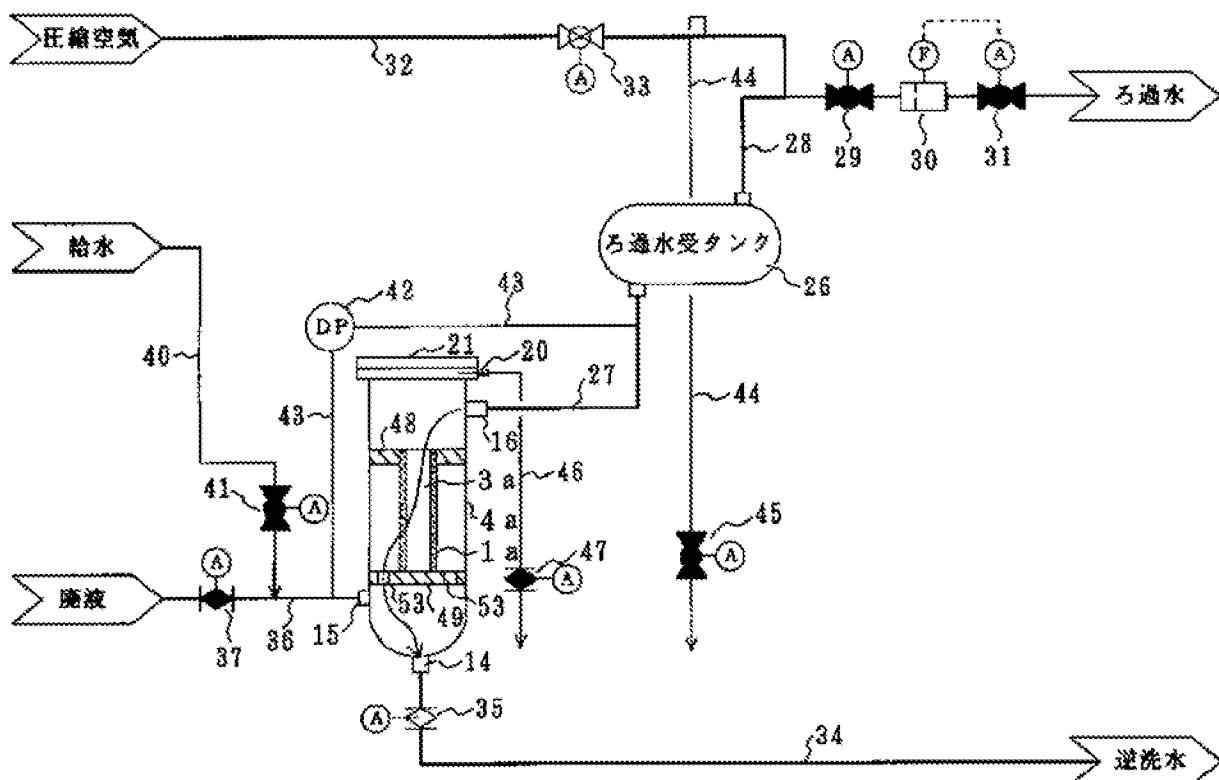
## DRAWINGS

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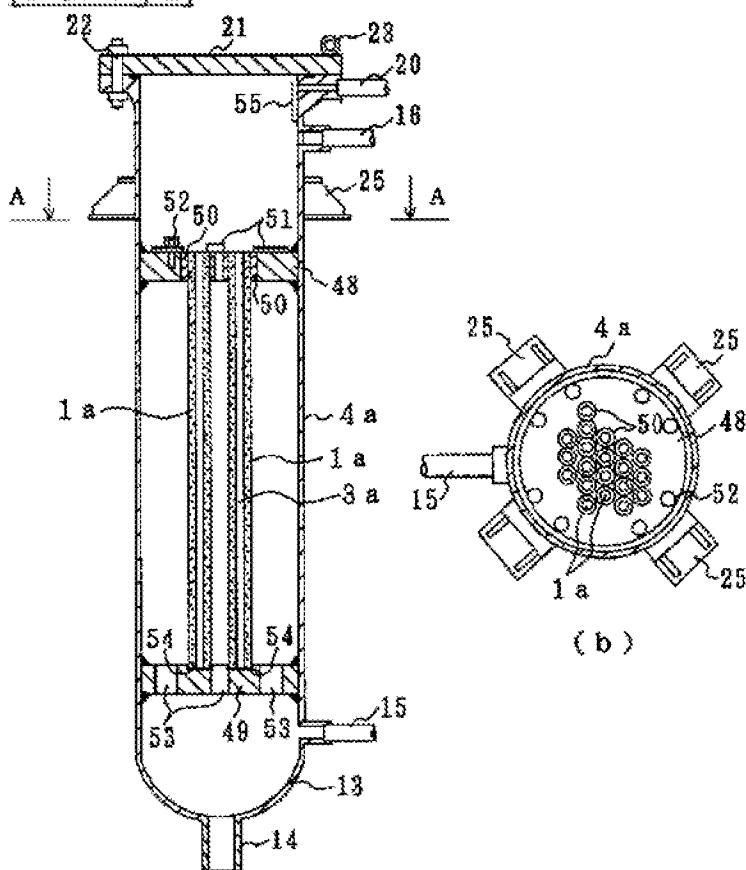
[Drawing 1]



[Drawing 3]

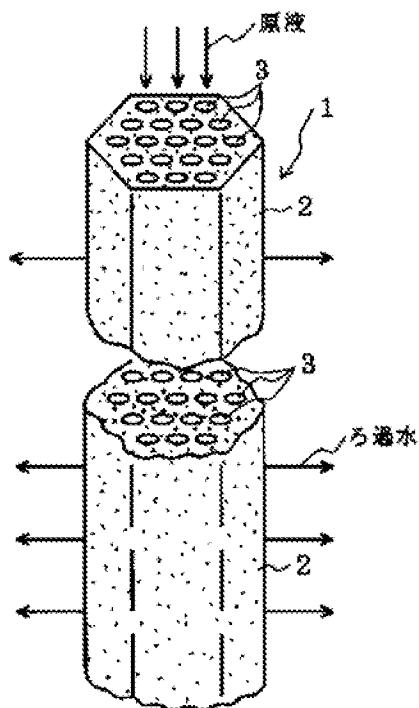


### [Drawing 2]

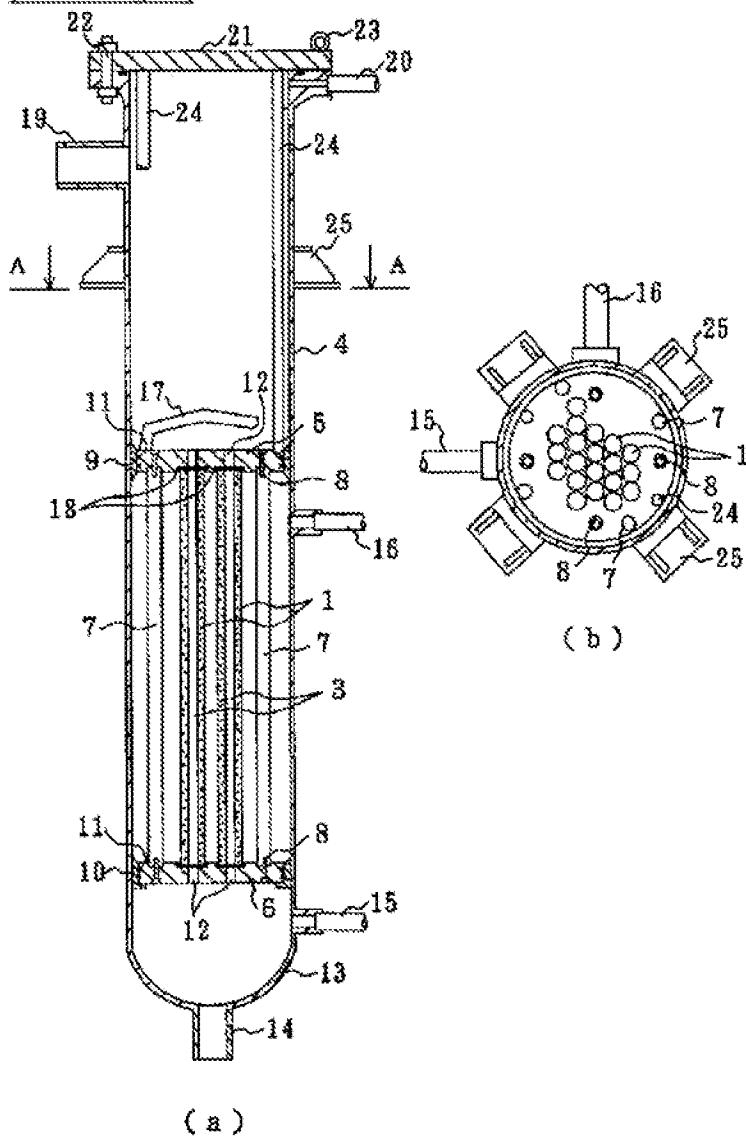


( a )

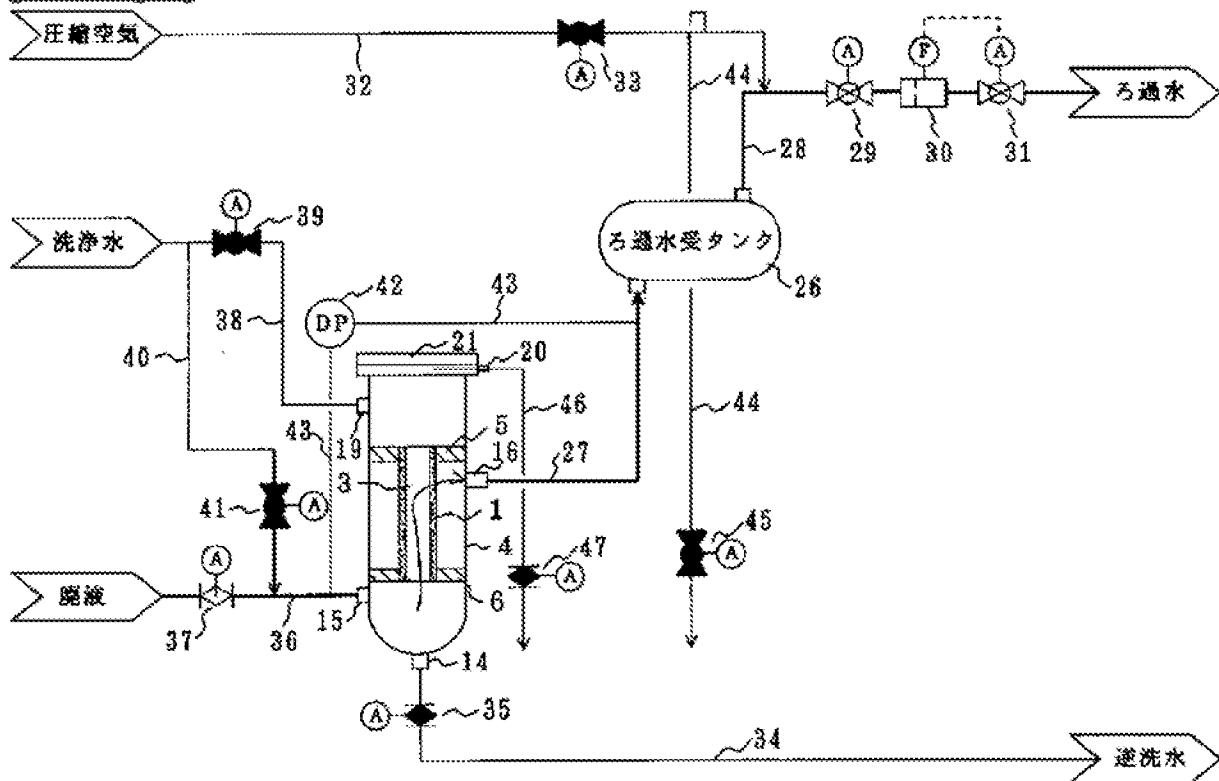
### [Drawing 4]



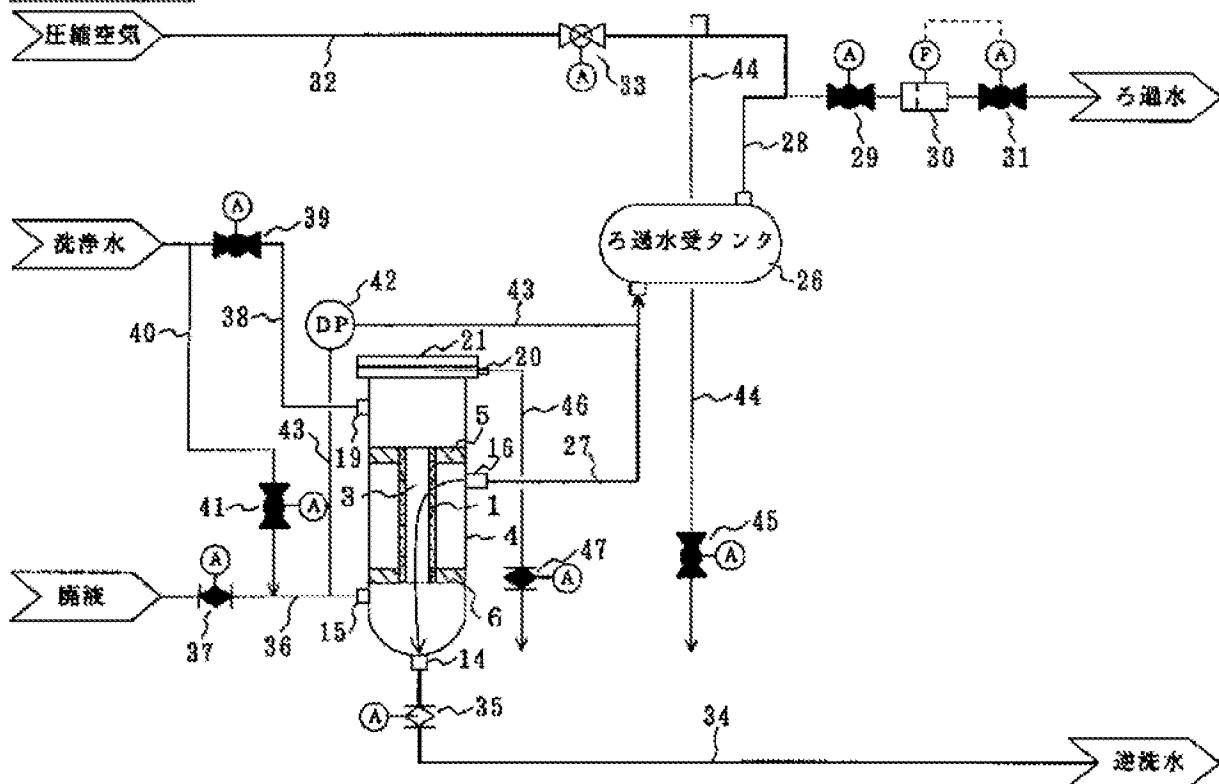
[Drawing 5]



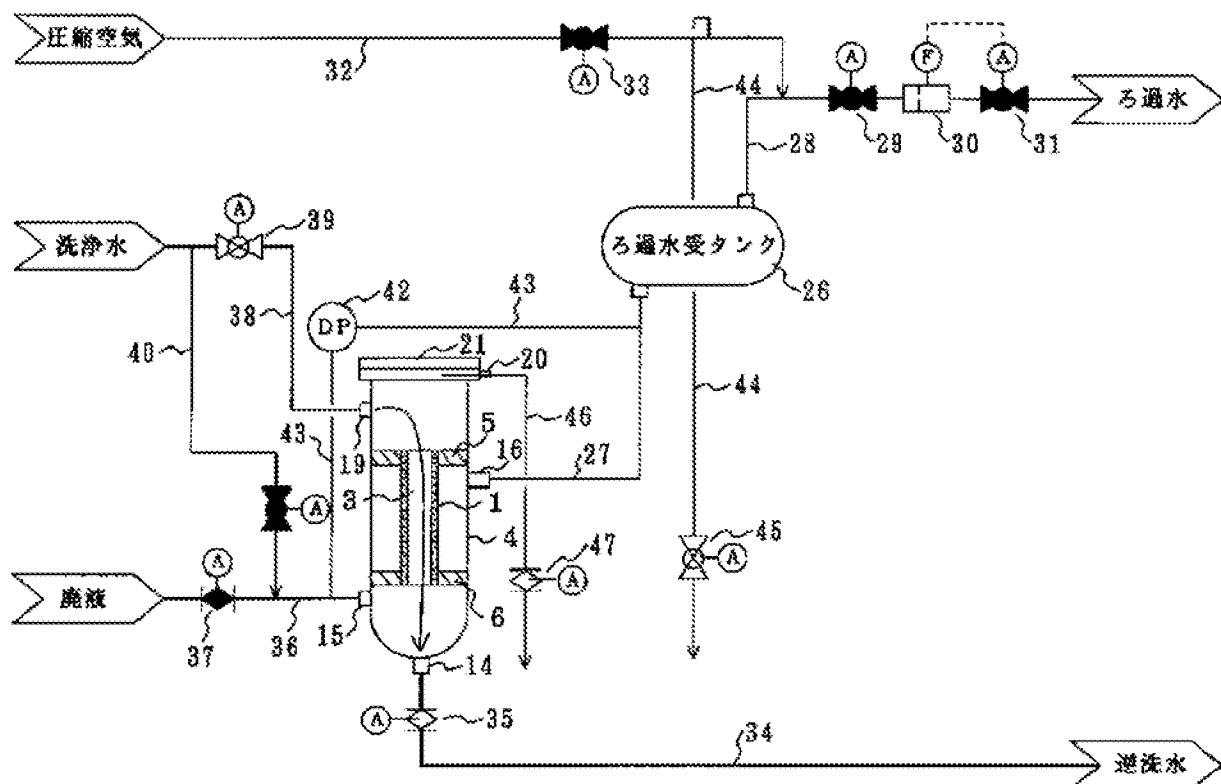
### [Drawing 6]



[Drawing 7]



### [Drawing 8]



[Translation done.]